EAST ASIA AND PACIFIC ENVIRONMENTAL INITIATIVE CLOSEOUT REPORT
Coral Bleaching Program

FY 1999 - FY 2000
EAPEI Goal: Improved Marine Resources Biodiversity Conservation
Implementation Organization: University of Rhode Island
Coastal Resources Center, Coastal Resources Management Project II
April 2001

BACKGROUND CONTEXT AND ISSUES

Coral bleaching occurs when zooxanthellae—the symbiotic algae that provide coral polyps with nutrients—are expelled from the coral tissues. Severe or extended bleaching events, may ultimately cause the corals to die. Bleaching occurs at both localized and mass scales, with global bleaching events occurring in 1982-83 and 1998. A strong correlation exists between the incidence of coral bleaching and increases in water temperature above 30ºC and solar radiation. This relationship suggests that bleaching may occur with increased severity and frequency over the next 30-50 years as a consequence of global warming.

General trends observed during the 1998 mass coral bleaching included severe bleaching in the Indian Ocean, medium bleaching with pockets of severe events in the East-Asia and Pacific region, and medium to light bleaching episodes in the South Pacific and the Caribbean. The already severe impacts of destructive fishing and over-exploitation of the reef resources in the East Asia-Pacific region were compounded by this event and consequent coral mortality. Coral bleaching events are increasing in frequency, extent, and severity. These large-scale bleaching events are linked to global climate change and are expected to be a recurring problem. Because most island and coastal populations in the East Asia-Pacific region depend on coral reefs for nutrition, fisheries and tourist income, as well as coastal protection, mass coral bleaching and mortality create an environmental crisis that requires development of a focussed, coordinated US Government response. This response must be based on an understanding of the causes of coral bleaching and support the region as it seeks to understand and mitigate the long-term consequences of these events.

The extent to which coral bleaching results in significant ecological and socioeconomic impacts is related to the severity and extent of bleaching events in the future, which is currently unknown. The extent of future bleaching is also a key component to other questions, such as:

- Will healthy reefs be more resilient than degraded reefs?
- Will increasing sea surface temperature and related bleaching events cause long term shifts in the coral reef community structure?
- What is the effect of massive coral mortality on the abundance of fish species?

- What effects will coral bleaching and mortality have on tourism, fisheries, the livelihoods of coral reef-dependent communities, and coastal erosion?

PROGRAM OVERVIEW

The Coastal Resources Center was awarded funding through the East Asia and Pacific Environmental Initiative (EAPEI) to carry out several activities to address the 1998 mass coral bleaching event generally considered by most experts to be associated with global warming. Coral bleaching program activities began in October 1, 1999 as part of the USAID-URI Coastal Resources Management II (CRM II) Cooperative Agreement Year 5 Work Plan.

There were various agencies and organizations involved in the coral bleaching program. They included: the US Agency Members of the Coral Reef Task Force and International Coral Reef Initiative Partner Governments and Organizations, Global Coral Reef Monitoring Network (GCRMN), 9th International Coral Reef Symposium (9ICRS), and the University of the Philippines Marine Science Institute (UPMSI).

PROGRAM OBJECTIVES

The goal of this coral bleaching program was to support the U.S. Coral Reef Task Force and International Coral Reef Initiative (ICRI) efforts in the East Asia-Pacific (EAP) region to understand the science of coral bleaching, as well as the ecological and socioeconomic impacts of coral bleaching and associated mortality. This program was implemented through the CRM II Cooperative Agreement between URI-CRC and USAID/G/ENV.

The major results of this program included the following:

- Financially and technically supported the Convention on Biological Diversity (CBD) Expert Meeting on coral bleaching held in Manila, Philippines (October 1999) to analyze the coral bleaching phenomena, the potentially severe loss of biological diversity and consequent socioeconomic impacts. The findings from this meeting, which was hosted by ICLARM, were synthesized into a report to advise the CBD technical panel which consequently recommended the CBD Conference of Parties adopt definitive resolutions related to coral bleaching (see attachments).
- Convened a special session at the International Coral Reef Symposium (October 2000) on the socioeconomic and ecological impacts of mass coral bleaching.
- Conducted studies by the Marine Science Institute-University of the Philippines into the ecological and socioeconomic impacts of the 1998 mass coral bleaching event in two locations in the Philippines. Supported a Reef Check Foundation rapid survey of the ecological impact of a coral bleaching episode in Fiji earlier this year.

SPECIFIC ACTIVITIES AND RESULTS

CBD Expert Meeting: The Conference of the Parties to the Convention on Biological Diversity requested its Subsidiary Body on Scientific Technical and Technological Advice (SBSTTA) to analyze the coral bleaching phenomenon, the potentially severe loss of biological diversity and consequent socioeconomic impacts. In order to assist the work of SBSTTA at its meeting on this topic, the Executive Secretary of the Convention convened an Expert Consultation on coral bleaching at ICLARM, in Manila, Philippines from 11-13 October 1999. Seed funding for this meeting was provided through the EAP-ICRI Coral Bleaching Program, and a CRC staff member attended as an observer. During this meeting, the CRC attendee (Brian Crawford) was asked to provide information on the socioeconomic impacts of coral bleaching, and suggest possible responses.

9th International Coral Reef Symposium (9ICRS): The coral bleaching program provided limited travel support for some presenters/participants of a special session on coral bleaching at 9ICRS. CRC-URI and the U.S. State Department convened the session entitled: *Coral Bleaching: Assessing and Linking Ecological and Socioeconomic Impacts, Future Trends and Mitigation Planning*. Papers presented at the session will be included in the conference proceedings, and several were already published in a special compendium (see attachments).

Ecological and Socioeconomic Impact Studies: CRC coordinated various expert evaluations of the ecological and socioeconomic impacts of mass bleaching events in the East Asian and Pacific region. Some of these results were presented at the 9ICRS session on coral bleaching and otherwise disseminated through newsletter articles, etc.

OUTPUTS AND PRODUCTS

There were four major lessons learned from this activity.

- The first is that there is a need for a mechanism that can be quickly accessed and deployed to assess impacts. This is needed due to the unpredictable nature of coral bleaching and the urgency with which coral bleaching impact assessments must be undertaken to avoid loss of valuable information.

- We should realize that there is little information available on the ecological and socioeconomic impacts of mass bleaching events and associated mortality on communities in the East Asia and Pacific region, and globally. Improvements are necessary in systematically monitoring and cataloging bleaching events as they occur. High coral mortality appears to have the highest impact on local dive tourism (see El Nido report, attached), while the impacts of coral bleaching on fisheries are less obvious (see Bolinao report, attached). As bleaching events increase in frequency and severity, the impacts upon fisheries may become more evident.

- The third lesson is that there is a need for increased public education on mass coral bleaching and its similarities and differences to localized bleaching and other events (i.e., cyanide fishing) that cause coral death; as well as its links to global warming.

- Coral bleaching is likely to pose a significant threat to marine biological diversity and the welfare of reef-dependent human communities. Coral bleaching has unique emergency event characteristics that require tailored research, response and mitigation efforts. Within this context, there are significant opportunities to support research, public education and the development of mitigation strategies that can provide substantial benefits to successfully addressing the political, social and economic implications of mass coral bleaching and its root cause -- global warming.

The following products were produced as a result of this program, and are attached for review:

1) Cesar, H.S.J., 2000. Impacts of the 1998 Coral Bleaching Event on Tourism in El Nido, Philippines (report). Cesar Environmental Economics Consulting. The Netherlands.
2) Pet-Soede, L. 2000. Effects of coral bleaching on the socioeconomics of the fishery in Bolinao, Pangasinan, Philippines (report). Bali, Indonesia.
3) Lovell, E.R. 2001. Reef Check Description of the 2000 Mass Coral Bleaching Event in Fiji with reference to the South Pacific (report). Fiji.
4) Schuttenberg, H.Z. (ed.). 2001. Coral Bleaching: Causes, Consequences and Response (compendium of selected papers presented at the special session during the 9th ICRS). Coastal Resources Center, University of Rhode Island, USA.
5) Schuttenberg, H.Z. and D. Obura. (in press). The Socioeconomic impacts of coral bleaching (selection included in the USAID/WRI booklet on the 9th ICRS). .
6) Convention of Biologica Diversity. 1999. Expert Consultation on Coral Bleaching: Manila, Philippines.

PROGRAM IMPACT AND SUSTAINABILITY

In envisioning, designing and implementing this EAPEI-funded project, the URI-CRC has served a catalytic role in bringing together coral bleaching experts and other agencies/institutions. The primary collaborative niche with the ICRI and the USCRTF has created a focal point for coral bleaching within the overall program on global climate change.

After review of the CBD Expert Meeting report, the CBD's SBSTTA adopted coral bleaching recommendations on 5 February, 2000. These recommendations were considered by the CBD's full Conference of Parties in Nairobi, Kenya 15-26 May 2000. They call for increased identification, funding, and implementation of responses to coral bleaching and enhanced cooperation between governments and related global conventions and initiatives. In addition, there is a methodology for ecosystem evaluation

and assessment that is currently being adopted, and will be readily accessible on the Jakarta Mandate website (http://www.biodiv.org/jm.html).

The Conference of Parties (COP) formally endorsed the results of the Expert Consultation on Coral Bleaching, and decided to integrate coral reefs into program element 2 (Marine and Coastal Living Resources) of their Program of Work. The COP Executive Secretary was instructed to collaborate on coral bleaching with: the Convention on Wetlands; the Convention on International Trade in Endangered Species of Wild Fauna and Flora; the United Nations Educational, Scientific and Cultural Organization (including the World Heritage Convention); the Food and Agriculture Organization of the United Nations; regional fisheries organizations; the Intergovernmental Panel on Climate Change, and the Global International Waters Assessment. The Executive Secretary was also specifically mandated to collaborate with the Global Coral Reef Monitoring Network and the International Coral Reef Initiative.

It is likely that another mass coral bleaching event(s) will occur within the next few years. The US Agency for International Development, the US Department of State, and the US Coral Reef Task Force should consider a strategy and response that can be put into place quickly. The strategy should include public education for coastal residents and senior policy makers on the impacts of global climate change upon coastal and marine ecosystems (especially coral reefs).

BUDGET

Detail of Expenditures

Task Code	Program Element	Task Expenses	Task Subtotal	Estimated Budget
A.	CBD Experts Meeting		$25,000	$25,000
	ICLARM subcontract	$25,000		
B.	Bali 2000		18,956	19,783
	Travel	15,256		
	Honoraria	3,700		
C.	Impacts Studies		72,341	73,423
	Salary and Fringe	15,215		
	Consultants	52,292		
	Operating costs	4,834		
	(postage, computer, telephone, courier)			
	Compendium		6,927	
	Editorial, layout and design services	2,994		
	Printing	3,933		
	Total Direct	$ 123,224	$ 123,224	$ 118,206
D.	URI In-direct[1]			
	Indirect costs			33,904
	24% of direct costs	28,886	28,886	
	TOTAL EXPENDITURES	**$ 152,110**	**$ 152,110**	**$ 152,110**

[1] This is the negotiated rate for work under CRM II; it is substantially less than the Current URI indirect cost rate as negotiated with the USG.

*NOTE: this budget is for management purposes only, and is not an official URI accounting report